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Results of Tagging of Adult Atlantic Cod in Inshore Areas
of Newfoundland and Labrador During 1979-1982

by

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INTRODUCTION

During 1979-1982, 1972 adult Atlantic cod (*Gadus morhua*) were tagged in inshore locations in Newfoundland and Labrador (Fig. 1). Although in some cases cod less than 45 cm in length were tagged, only cod >45 cm are included in this paper (Table 1). Cod for tagging were caught by baited longline (Conception Bay, 1979), No. 36 otter trawl (Conception Bay 1980 and 1981) or Norwegian jigger (Orton Island, 1981 and Exploits-Fortune Harbour 1982) in depth of 7-95 m. Only cod classified to be in excellent condition were tagged. Any fish showing signs of bruising, jigger scars, scale loss, injuries to fins or gills, bleeding, and "pop eye" condition or with distended swim bladders were routinely culled during the tagging procedures. The cod were held in holding tanks, with running sea water. From holding tanks cod were captured with dip nets, measured, examined for the gill parasite *Lernaeocera branchialis*, and tagged. The cod were then placed in tanks filled with running sea water until they fully recovered (i.e. actively swam in the tank) and were released over the side of the boat. The cod were tagged using either Petersen disc and blank, Petersen disc and dangle combination or orange or yellow T-bar tags. These were generally applied in batches of 25 tags to cod randomly selected from the holding tank.

Recoveries are grouped arbitrarily by seasonal periods corresponding to the offshore fishery season (January-April) and the inshore fishery season (May-December) in 2J+3K+3L. The tag recoveries by all countries are grouped by Fisheries and Oceans unit areas (Fig. 1). The landings of cod by Newfoundland and Labrador fishermen from designated unit areas were obtained for each of the years 1979 to 1983 using comparable seasonal groupings as those used to group tag recaptures. The catches for these unit areas were used to calculate the tags recovered per 1,000 t of cod caught by Newfoundland and Labrador fishermen by season. The bracketed values in Tables 2-6 represent the numbers of tags reported/1000 t of cod. This assumes that the catch of cod is proportional to effort and is an attempt to standardize the tag recoveries to the unit of effort required to catch 1,000 t of cod.

RESULTS

Conception Bay, 1979

From the 436 adult cod tagged during October 19-November 05, 1979 in Conception Bay there were 4 returns during the October-December period, all from Conception Bay. Two of these were close to the tagging area in similar depths (27-37 m) in which they were tagged. Two were caught during Nov. 14 on the eastern, outer part of Conception Bay in 37 m and it appeared as if they were leaving the Bay. During the following January-April period (1980) there were 2 recoveries from Conception Bay, indicative of overwintering in Conception Bay. There were 2 returns from the offshore winter fishery, one from southeast Funk Island Bank and one from the north cape of the Grand Bank, two neighbouring areas (Table 2).

During May-December, 1980, the highest rate of returns (4.7/1000 t) was from Conception Bay followed by Trinity Bay (1.5) and eastern Avalon (1.0) indicative of homing to the tagging locality and/or overwintering in Conception Bay. There were also returns from the northern Grand Bank during December. These were probably cod which may have migrated inshore during

the summer and offshore again during the autumn to their overwintering area. There were single returns from the Virgin Rocks and the southern Grand Bank.

During January-April, 1981 there were single returns from Belle Isle Bank, Western Funk Island Bank, North Cape of the Grand Bank, and Placentia Bay. The Placentia Bay return is indicative that cod of the Avalon stock complex overwinter in the deeper bays around the Avalon Peninsula.

During the May-December fishing season of 1981 the highest rate of recovery (1.2) was from Conception Bay followed by Bonavista Bay (0.5) and Trinity Bay (0.4). Single returns were distributed from White Bay to the Virgin Rocks. There was also a single return reported from 4Vn during June caught by a longliner in 55-165 m. There were no recoveries reported during January-April 1982 or 1983.

During May-December, 1982, most tags were recovered from Trinity and Conception bays. The highest rates (0.3) were from Trinity Bay and Fortune Bay. This single recovery was the only one reported from Fortune Bay from this experiment.

During May-December, 1983 there were only 5 recoveries reported, ranging from White Bay to the Eastern Avalon Peninsula and the north cape of the Grand Bank.

In all years there were only 2 tags reported from northern 3K, none from 2J, only 3 from 3Ps, and single returns from 3O and 4Vn. This indicates that the cod of the Conception Bay feeding concentration during summer are closely related to the neighbouring northern Grand Bank and the other intermingled stocks of the Avalon stock complex, homing during the summer period to Conception Bay or neighbouring areas.

Conception Bay, 1980

From the tagging of 766 adult cod in Conception Bay during October 9-19, 1980, there were 10 recoveries during October-December (Table 3). There were 7 from Conception Bay, 2 of which were from the tagging area and another 5 from the eastern shore of Conception Bay apparently from cod leaving or about to leave the Bay during late October and November. During October there was a recovery by an otter trawler from the northern slope of the Grand Bank (200 m) just 19 days after the tagged cod was released. Just after the cod were tagged in Conception Bay, there was a period of several days of strong westerly gales and this may partly explain cod leaving the Bay. At about the same time catches by local fishermen decreased markedly. In addition there were 2 further recoveries during November and December 1980 of tagged cod on the northwestern Grand Bank and Avalon channels by otter trawlers in about 180m depth.

There were 2 tags recovered on the northwestern Grand Bank during January-April, 1981, single recoveries from Trinity (183 m) and Conception bays (26 m) during April. There was a single recapture from northern Funk Island Bank. During May-December, 1981 the greatest number of recoveries and the highest rate (38(7.7)) were from Conception Bay followed by Trinity Bay (19(2.5)). Other inshore areas had recovery rates ≤ 0.6 . There were 2 tags recovered from the northern Grand Bank, one off Cape Race and one from the northern part of Div. 30.

During January-April, 1982 there were 2 tags recovered from the north cape of the Grand Bank, one each from Avalon Channel and western Funk Island Bank. During May-December, 1982 the highest rate of return was from Conception Bay (1.7) followed by Trinity Bay (1.0). Other areas had rates less than 0.5. There was a single recovery from Cape Makkovik. During January-April, 1983 there were only 3 recoveries reported, all from the northeastern slope of Funk Island Bank.

During May-December, 1983 the highest rate of recovery was again from Conception Bay (0.5) followed by Bonavista and Trinity bays and northern Grand Bank (0.2). There was one recovery (0.1) from the southern Labrador coast.

The persistence of higher relative recovery rates from Conception Bay and neighbouring areas is indicative of homing to a specified feeding area and a return of these cod to overwintering area along the northern slopes of the Grand Bank and Funk Island Bank.

Conception Bay, January, 1981

During May-December, 1981 there were 12 tags recovered, of which 10(2.0/1000 t) were from Conception Bay from the tagging of 60 adult cod during January. This is strong indication that these cod remained in the bay overwinter (Table 4).

There was one recovery the following April, 1982, about 8 miles from the tagging site at the head of the Bay. During May-December, 1982 there were single recoveries from Conception

Bay and the eastern Avalon. During May-December, 1983 there were 4 recaptures (0.5) from Conception Bay and 1(0.3) from White Bay. Thus, there is some indication of overwintering in the Bay and assuming that there was emigration after January 1981 on the following autumn, there was a strong homing tendency to return to the general tagging area.

Orton Island, August, 1981

From the tagging of 338 adult cod near Orton Island, Labrador, there were 3 recoveries during November-December, 1981, of which 2 were from the outer slopes of Harrison Bank (302-314 m) and one from the outer slope of Makkovik Bank (260 m) (Lear MS 1982). During January-April, 1982, there were 23 returns ranging from the southeastern edge of Makkovik Bank to Belle Isle Bank but Hamilton Bank had the highest number of recovered tags (11) (Table 5). The overwintering area of the cod which feed in the Nain area appears to be around the slopes of Hamilton Bank. The absence of fishing in 2G and 2H possibly biases the results but 23 tags represents 8% recovery (exploitation) rate after allowing for 10% immediate tagging mortality.

During May-December, 1982 there were 5 returns from offshore northern Labrador (Cape Harrison to Nain) and one from Funk Island Bank. There were no inshore captures.

During January-April, 1983 there were 4 tags recovered from southeastern Hamilton Bank and 2 from the northeastern Funk Island Bank. During May-December, 1983 there were 3 tags recovered from offshore (northern 3K to 2H) and one reported inshore from the Strait of Belle Isle.

These results indicate an overwintering area mainly around the slopes of Hamilton Bank for cod which migrate to the Nain area for summer feeding bearing in mind the possible bias introduced by a fishing pattern in which the activity is mainly south of Cape Harrison during January-April.

Exploits and Fortune Harbour, September, 1982

From 372 adult cod tagged near Exploits and Fortune Harbour during September 20-28, 1982, there were 6 tags recovered (Table 6) from the immediate tagging area during October-December, 1982. During January-April, 1983, there were 3 tags recovered offshore from the Belle Isle Bank and the north slope of Funk Island Bank. There was a single recapture from Bonavista Bay during January, 1983 in 46 m depth.

During May-December, 1983, most cod tags were recovered in the vicinity of the tagging area, mainly in area 339 (24 (1.1)) and in 340 (8(0.7)). There was a single northern recapture from Makkovik Bank. Again, there is evidence of a return to summer feeding areas in which these cod were present the previous year.

SUMMARY

- 1) Recoveries of tags applied to adult cod during autumn 1979 and 1980 in Conception Bay indicate that the main offshore overwintering area of these cod is the northern slope of the Grand Bank and to a lesser extent the Funk Island Bank. Cod return during summer to the same general areas where they were tagged. This confirms similar results found by Templeman (1974, 1979).
- 2) Cod tagged during January, 1981 in Conception Bay tended to stay mainly within the confines of the Bay but occasionally were recovered outside.
- 3) Adult cod tagged at Orton Island, Nain, during August of 1981 were recaptured offshore during winter-spring mainly along the slopes of Hamilton Bank and occasionally as far south as the Belle Isle Bank and Funk Island Bank.
- 4) Adult cod tagged at Exploits and Fortune Harbour, 1982, were recaptured offshore during January-April mainly on Funk Island and Belle Isle banks while during summer they returned to the same feeding areas in which they had been tagged.

REFERENCES

- Lear, W.H. MS. 1982. Discrimination of the cod stock complex in Division 2J+3KL based on tagging. NAFO SCR Doc. 82/IX/89, Ser. No. N598. 33 p.

Templeman, W. 1974. Migrations and intermingling of Atlantic cod (Gadus morhua) stocks of the Newfoundland area. J. Fish. Res. Board Can. 31: 1073-1092.

1979. Migrations and intermingling of stocks of Atlantic cod, (Gadus morhua, of the Newfoundland and adjacent areas from tagging in 1962-66. ICNAF Res. Bull. No. 14: 5-50.

Table 1 Fork length distributions of adult (≥ 45 cm) Atlantic cod tagged at various inshore localities in Newfoundland and Labrador

Tagging area	Conception Bay	Conception Bay	Conception Bay	Orton Isl.	Exploits & Fortune Hr.
Date	Oct.19-Nov.05	Oct.09-19	Jan.22-29	Aug. 20	Sept.20-28
Year	1979	1980	1981	1981	1982
Depth (m)	26-70	35-94	44-95	7-26	20-35
Fork Length (cm)					
45-47	49	99	4		55
48-50	44	89	2		67
51-53	46	139	7		63
54-56	55	83	9	2	56
57-59	63	74	12	4	35
60-62	42	80	10	23	32
63-65	32	56	6	40	25
66-68	30	43	3	69	15
69-71	19	24	2	66	7
72-74	17	19	1	48	8
75-77	7	17		29	3
78-80	9	8	1	20	1
81-83	9	9	1	14	1
84-86	4	4	1	11	2
87-89	4	2		6	1
90-92	3	2	1	1	
93-95	2	2		4	
96-98	1	2			
99-101		3			
102-104				1	
105-107		1			
108-110		3			1
111-113		1			
114-116		3			
117-119		2			
120-122					
123-125					
126-128					
129-131		1			
Total	436	766	60	338	372

Table 2. Recoveries from 436 adult Atlantic cod tagged in Conception Bay during October 19-November 05, 1979. Numbers in brackets indicate tags recovered for each 1,000 t of cod caught by Newfoundland fishermen.

Locality	Stat. Area	1979	1980		1981		1982	1983	1980-1983	
		Oct.-Dec.	Jan.-Apr.	May-Dec.	Jan.-Apr.	May-Dec.	May-Dec.	May-Dec.	Jan.-April	May-Dec.
Belle Isle Bank	204				1				1	
W Funk Island Bank	344				1				1	
SE Funk Is. Bank	346		1(0.3)			1			1	1
White Bay	341					1(0.3)		1(0.3)		2
Notre Dame Bay (E)	339			3(0.2)		1(0.1)		1(0.1)		5
Bonavista Bay	338			2(0.4)		4(0.5)				6
Trinity Bay	337			9(1.5)		3(0.4)	4(0.3)			16
Conception Bay	336	4	2	29(4.7)		6(1.2)	2(0.2)	1(0.1)	2	38
Eastern Avalon	335			13(1.0)		3(0.2)	1(0.1)	1(0.1)		18
St. Mary's Bay	334			5(0.9)						5
Placentia Bay	304			2(0.2)	1				1	2
Fortune Bay	303						1(0.3)			1
North Cape of										
Grand Bank	330		1	1	1(1.6)		1(0.1)	1(0.2)	2	3
NW Grand Bank	331			1(0.9)						1
Virgin Rocks	328			1(1.2)		1(0.3)				2
30	314			1						1
4Vn	420					1				1

Table 3. Recoveries from 766 adult Atlantic cod tagged in Conception Bay during October 09-19, 1980. Numbers in brackets indicate tags recovered for each 1,000 t of cod caught by Newfoundland fishermen.

Locality	Stat. Area	1979	1981		1982		1983		1981-1983	
		Oct.-Dec.	Jan.-Apr.	May-Dec.	Jan.-Apr.	May-Dec.	Jan.-Apr.	May-Dec.	Jan.-Apr.	May-Dec.
Makkovik-										
Harrison Area	209					1(0.3)				1
Southern Labrador										
Coast	201							1(0.1)		1
N. Funk Island Bank	347		1(0.1)				3(0.4)	1	4	1
W. Funk Island Bank	344				1(1.0)				1	
Notre Dame Bay (W)	340			1(0.2)		1(0.1)				2
Notre Dame Bay (E)	339			3(0.3)				1(0.1)		4
Bonavista Bay	338			4(0.5)		1(0.1)		2(0.2)		7
Trinity Bay	337		1	19(2.5)		12(1.0)		2(0.2)	1	33
Conception Bay	336	7	1	38(7.7)		14(1.7)		4(0.5)	1	56
Eastern Avalon	335			9(0.6)		8(0.4)		2(0.1)		19
St. Mary's Bay	334					1(0.2)				1
Placentia Bay	304							1(0.1)		1
N. Cape of										
Grand Bank	330			1(0.1)	2(0.2)	1(0.1)		1(0.2)	2	3
NW Grand Bank	331	2	2(1.4)	1(5.8)					2	1
Avalon Channel	332	1			1(0.6)				1	
E. of Cape Race	333			1(1.0)						1
30	314			1(2.1)						1
Eastern Grand Bank	327					1				1

Table 4. Recoveries from 60 adult Atlantic cod tagged in Conception Bay during January 22-29, 1981. Numbers in brackets indicate tags recovered for each 1,000 t of cod caught by Newfoundland fishermen.

Locality	Stat. Area	1981	1982		1983	1981-1983	
		May-Dec.	Jan.-Apr.	May-Dec.	May-Dec.	Jan.-Apr.	May-Dec.
White Bay	341				1(0.3)		1
Trinity Bay	337	1(0.1)					1
Conception Bay	336	10(2.0)	1	190.10	4(0.5)	1	15
Eastern Avalon	335	1(0.1)		1(0.1)			2

Table 5. Recoveries from 338 adult Atlantic cod tagged at Orton Island, Nain on August 20, 1981. Numbers in brackets indicate tags recovered for each 1,000 t of cod caught by Newfoundland fishermen.

Locality	Stat. Area	1981	1982		1983		1982-1983	
		Nov.-Dec.	Jan.-Apr.	May-Dec.	Jan.-Apr.	May-Dec.	Jan.-Apr.	May-Dec.
Hopedale-Nain	212			3(1.2)				3
Harrison Bank	213	2		1		1		2
Makkovik Bank	214	1	3	1(2.3)			3	1
Cape Harrison Area	209					1(0.5)		1
NE Hamilton Bank	211		11				11	
SE Hamilton Bank	206		4(0.3)		4(0.1)		8	
Belle Isle Bank	203		5(0.1)				5	
N.Funk Island Bank	347			1	2(0.1)	1(0.2)	2	2
Strait of Belle Isle	401					1(0.03)		1

Table 6. Recoveries from 372 adult Atlantic cod tagged at Exploits and, Fortune Harbour, Notre Dame Bay, during September 20-28, 1982. Numbers in brackets indicate tags recovered for each 1,000 t of cod caught by Newfoundland fishermen.

Locality	Stat. Area	1982	1983	
		October-December	January-April	May-December
Makkovik Bank (N)	213			1
Belle Isle Bank	203		1(0.9)	
N.Funk Island Bank	347		2(0.1)	
St. Anthony area	342			1(0.2)
Notre Dame Bay (W)	340			8(0.7)
Notre Dame Bay (E)	339	6(19.5)		24(1.1)
Bonavista Bay	338		1	5(0.4)
Conception Bay	336			1(0.1)

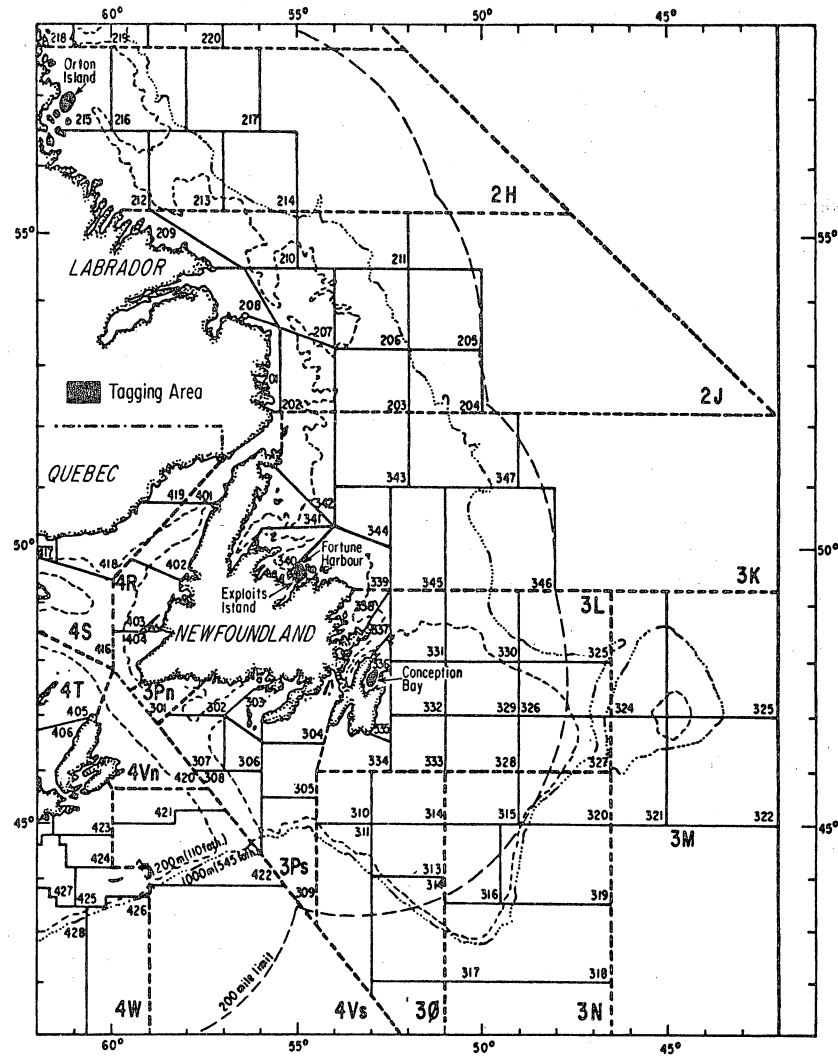


Fig. 1. Area map showing tagging localities, NAFO Divisions and Fisheries and Oceans Statistical areas.

